

**MADALPINGELISED LÜLITUSAPARAADID.
OSA 5-2: JUHTIMISAHELAAPARAADID JA
LÜLITUSELEMENDID. LÄHEDUSLÜLITID**

**Low-voltage switchgear and controlgear -
Part 5-2: Control circuit devices and switching elements
- Proximity switches (IEC 60947-5-2:2019)**

EESTI STANDARDI EESSÕNA**NATIONAL FOREWORD**

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Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas. Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 27.03.2020, muudatus A11 15.04.2022.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation. Date of Availability of the European standard is 27.03.2020, for A11 15.04.2022.
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ICS 29.120.40; 29.130.20

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EN IEC 60947-5-2 + A11

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2020, April 2022

ICS 29.120.40; 29.130.20

Supersedes EN 60947-5-2:2007 and all of its amendments and corrigenda (if any)

English Version

Low-voltage switchgear and controlgear - Part 5-2: Control circuit devices and switching elements - Proximity switches (IEC 60947-5-2:2019)

Appareillage à basse tension - Partie 5-2: Appareils et éléments de commutation pour circuits de commande - Détecteurs de proximité
(IEC 60947-5-2:2019)

Nieder Spannungsschaltgeräte - Teil 5-2: Steuergeräte und Schaltelemente - Näherungsschalter
(IEC 60947-5-2:2019)

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Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 121A/313/FDIS, future edition 4 of IEC 60947-5-2, prepared by SC 121A "Low-voltage switchgear and controlgear" of IEC/TC 121 "Switchgear and controlgear and their assemblies for low voltage" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60947-5-2:2020.

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- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-09-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-03-27

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IEC 60825 (series)	NOTE	Harmonized as EN 60825 (series)
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IEC 61076-2-101	NOTE	Harmonized as EN 61076-2-101
IEC 61076-2-104	NOTE	Harmonized as EN 61076-2-104
IEC 61076-2-105	NOTE	Harmonized as EN 61076-2-105
IEC 62471:2006	NOTE	Harmonized as EN 62471:2008 (modified)
IEC 62683-1:2017	NOTE	Harmonized as EN 62683-1:2017 (not modified)
ISO 7010	NOTE	Harmonized as EN ISO 7010

A11 Amendment A11 European foreword

This document (EN IEC 60947-5-2:2020/A11:2022) has been prepared by CLC/TC 121A “Low-voltage switchgear and controlgear”.

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- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023–02–28
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It specifies additional safety and EMC requirements for proximity switches that incorporate radio functionality in a fixed and permanent manner.

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INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Low-voltage switchgear and controlgear –
Part 5-2: Control circuit devices and switching elements – Proximity switches**

**Appareillage à basse tension –
Partie 5-2: Appareils et éléments de commutation pour circuits de commande –
DéTECTEURS DE PROXIMITÉ**



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DéTECTEURS de proximité**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.40; 29.130.20

ISBN 978-2-8322-7445-3

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 5-2: Control circuit devices and switching elements – Proximity switches

FOREWORD

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International Standard IEC 60947-5-2 has been prepared by subcommittee 121A: Low-voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage.

This fourth edition cancels and replaces the third edition published in 2007 and Amendment 1:2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- update of the scope;
- adaptation and update of the construction requirements according to IEC Guide 116 (e.g. material requirements, artificial optical radiation, instruction requirements, hot surface, unattended operation, foreseeable misuse...);
- modification of the specifications concerning the sensing range and operating distance;

- new definitions for photoelectric proximity switch type D with background suppression;
- integration of the requirements and test procedures of photoelectric proximity switch type D with background suppression;
- update of EMC requirements in Table 9 and Table 10;
- integration of environmental information requirements and environmental condition by referencing Annexes O, W and Q of IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010 and IEC 60947-1:2007/AMD2:2014;
- modification of impulse withstand voltage test (5.3.1.3, 9.3.3.4.5);
- modification of the references in the (normative) standard body to the (informative) Annex A;
- major update of Annex A (definitions update, new dimensions and shapes);
- update of C.9.1.1;
- update of Annex D in order to consider new connector types and normative references;
- update of Annex F (additional symbols for photoelectric proximity switches).

The text of this standard is based on the following documents:

FDIS	Report on voting
121A/313/FDIS	121A/322/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 60947 series, under the general title *Low-voltage switchgear and controlgear*, can be found on the IEC website.

This International Standard should be used in conjunction with IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010 and IEC 60947-1:2007/AMD2:2014.

The provisions of the general rules, IEC 60947-1, are applicable to this document, where specifically called for. General rules, clauses and subclauses thus applicable, as well as tables, figures and annexes are identified by a reference to IEC 60947-1, for example 1.2.3, Table 4 or Annex A of IEC 60947-1:2007.

The following differing practices of a less permanent nature exist in the countries indicated below.

- 8.1.7.3: recommendations are given in the National US Electrical Code about connections means;
- 8.1.7.4: in the United States of America, there are other documents that define conductor colour coding schemes that can apply to the installation of proximity switches;
- 8.1.15.2: for European Union Countries: in certain ranges the defined limits of exposure values in IEC 60825-1:2014 exceed the requirements of the European directive 2006/25/EC Directive on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation).

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,

- replaced by a revised edition, or
- amended.

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 5-2: Control circuit devices and switching elements – Proximity switches

1 Scope

This part of IEC 60947 applies to inductive and capacitive proximity switches that sense the presence of metallic and/or non-metallic objects, ultrasonic proximity switches that sense the presence of sound reflecting objects, photoelectric proximity switches that sense the presence of objects and non-mechanical magnetic proximity switches that sense the presence of objects with a magnetic field.

Products covered by the scope of this document are not subjected to defined behaviours under fault conditions. Proximity switches with defined behaviour are covered by IEC 60947-5-3 and have to fulfil additional requirements.

These proximity switches are self-contained, have semiconductor switching element(s) and are intended to be connected to circuits, the rated voltage of which does not exceed 250 V 50 Hz/60 Hz AC RMS or 300 V DC.

Examples of typical applications for in-scope products:

- factory automation and machinery industry;
- logistic and packaging industry;
- conveyor belts, lifts;
- process industry;
- power plants.

Special applications (e.g. corrosive atmosphere) can cause additional requirements.

This document is not intended to cover proximity switches with analogue outputs.

The object of this document is to state for proximity switches:

- definitions;
- classification;
- characteristics;
- product information;
- normal service, mounting and transport conditions;
- constructional and performance requirements;
- tests to verify rated characteristics.

Products covered by the scope of this document are expected to be selected, installed, and maintained by skilled personnel only.

A11 Annex ZC of this document defines requirements in respect of safety under article 3.1(a) and Electromagnetic Compatibility (EMC) under article 3.1(b) of Directive 2014/53/EU for proximity switches that incorporate one or more radio technologies as set out in ZC.4 in a fixed and permanent manner.

NOTE Requirements applicable to the efficient use of radio spectrum are not included in this document. These requirements can be found in the applicable ETSI product standard(s) for the effective use of the radio spectrum under article 3.2 of Directive 2014/53/EU. 

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 60445:2017, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60695-2-10:2013, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-2-12:2010, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

IEC 60695-2-12:2010/AMD1:2014

IEC 60825-1:2014, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-1:2007/AMD1:2010

IEC 60947-1:2007/AMD2:2014

IEC 60947-5-3, *Low-voltage switchgear and controlgear – Part 5-3: Control circuit devices and switching elements – Requirements for proximity devices with defined behaviour under fault conditions (PDDB)*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*
IEC 61000-4-11:2004/AMD1:2017

IEC 61076-2 (all parts), *Connectors for electronic equipment – Product requirements – Part 2: Circular connectors*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 62443 (all parts), *Industrial communication networks – Network and system security*

IEC 62471 (all parts), *Photobiological safety of lamps and lamp systems*

IEC TR 62471-2:2009, *Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016

IEC Guide 117:2010, *Electrotechnical equipment – Temperatures of touchable hot surfaces*

EN 10084:2008, *Case hardening steels – Technical delivery conditions*

EN 55032:2015, *Electromagnetic compatibility of multimedia equipment - Emission Requirements*

EN IEC 61000-6-4:2019, *Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments*

EN IEC 62311:2020, *Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz)*

EN 62479:2010, *Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)*

ETSI EN 301-489-3, V2.1.1, *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU*

ETSI EN 301-489-17, V3.2.4, *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility*

ETSI EN 301-489-19, V2.1.1, *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation, and timing data; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU*

ETSI EN 301-489-33, V2.2.1, *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 33: Specific conditions for Ultra-WideBand (UWB) devices; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU ^(A11)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Clause 2 of IEC 60947-1:2007, IEC 60947-1:2007AMD1:2010, IEC 60947-1:2007/AMD2:2014 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

<i>Alphabetical index of terms</i>	<i>References</i>
A	
Active optical signal	3.4.1.7
Adjuster	3.2.15
Adjuster <capacitive proximity switch>	3.2.15.1
Adjuster <ultrasonic or photoelectric proximity switch>	3.2.15.2
Ambient light <photoelectric proximity switch>	3.4.7
Assured operating distance	3.3.1.7
Axial approach	3.3.3
B	
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C	
Capacitive proximity switch	3.1.1.2